REMARKS

Claims 1-24, 26, and 28-40 are pending in the present application. Claims 25 and 27 have been cancelled without prejudice or disclaimer to the subject matter contained therein.

A. Rejection of Claims 11-23 under 35 U.S.C. §102(b)

Claims 11-23 have been rejected under 35 U.S.C. §102(b) as being anticipated by Kindt et al. (US Patent 6,348,681). This rejection, in view of the above amendments, is respectfully traversed.

In formulating the rejection under 35 U.S.C. §102(b), the Examiner alleges that Kindt et al. discloses initiating an integration period for the light-detecting element; resetting, a plurality of times, the voltage level of the sense node after initiating the integration period; and measuring, only once during the integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the plural resettings of the voltage level of the sense node and prior to initiating a next integration period. From these allegations, the Examiner concludes that Kindt et al. anticipates the presently claimed invention. These allegations and conclusion, in view of the above amendments, are respectfully traversed.

1. Independent Claim 11

As set forth above, independent claim 11 recites a method for measuring a sense node voltage associated with a light detecting element, the sense node voltage being related to light intensity incident upon the light detecting element by initiating an integration period for the light-detecting element; resetting, using a plurality of intra-period reset pulses, a plurality of times, the voltage level of the sense node after initiating the integration period, the intra-period reset pulses progressively decreasing in pulse width; and measuring, only once during the integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the plural resettings of the voltage level of the sense node and prior to initiating a next integration period.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a

second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 11.

2. Independent Claim 16

As set forth above, independent claim 16 recites a method for capturing a frame of image data associated with a scene using an array of light-detecting elements, each light-detecting element having an associated sense node by initiating an integration period for the array of light-detecting elements, the integration period being associated with the frame of image data; generating a plurality of intra-period reset pulses during the integration period such that voltage levels of the sense nodes associated with a portion of the array of light-detecting elements are enabled to be set a plurality of times during the integration period, the intra-period reset pulses progressively decreasing in pulse width; and measuring, only once during the integration period, the voltage levels of the sense nodes voltages generated in response to incident light intensities, the sense node voltages being measured subsequent to a final resetting of the voltage levels of the sense nodes associated with the portion of the array of light-detecting elements and prior to initiating a next integration period.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 16.

3. Independent Claim 21

As set forth above, independent claim 21 recites a method for measuring a sense node voltage associated with a light detecting element, the sense node voltage being related to light intensity incident upon the light detecting element by initiating an integration period for the light-detecting element; resetting, a first number of times during the integration period, using a number of intra-period reset pulses, the number of intra-period reset pulses being equal to the first number of times, the voltage level of the sense node after initiating the integration period, the intra-period reset pulses progressively decreasing in pulse width; and measuring the sense node voltage generated in response to incident light intensity, the sense node voltage being measured a second number of times during the integration period, the second number of times being less than the first number of times.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 21.

4. Dependent Claims

With respect to dependent claims 12-15, 17-20, 22, and 23, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly from allowable independent claims 11, 16, and 21. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §102(b).

B. Rejection of Claims 1-10 and 24-40 under 35 U.S.C. §103

Claims 1-10 and 24-40 have been rejected under 35 U.S.C. §103 as being unpatenable over Kindt et al. (US Patent 6,348,681). This rejection, in view of the above amendments, is respectfully traversed.

In formulating the rejection under 35 U.S.C. §103, the Examiner alleges that Kindt et al. discloses initiating an integration period for the light-detecting element; resetting, a plurality of times, the voltage level of the sense node after initiating the integration period; and measuring, only once during the integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the plural resettings of the voltage level of the sense node and prior to initiating a next integration period. From these allegations, the Examiner concludes that Kindt et al. would render the presently claimed invention obvious to one of ordinary skill in the art. These allegations and conclusion, in view of the above amendments, are respectfully traversed.

1. Independent Claim 1

As set forth above, independent claim 1 recites a method for measuring a sense node voltage associated with a light-detecting element, the sense node voltage being related to light intensity incident upon the light-detecting element by generating a first integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the first integration reset pulse, an edge of the first integration reset pulse triggering a beginning of a first integration period; generating a second integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the second integration reset pulse, an edge of the second integration reset pulse triggering a beginning of a second integration period; generating, subsequent to the generation of the first integration reset pulse and prior to the generation of the second integration reset pulse, a plurality of intra-period reset pulses to enable resetting of the sense node voltage to a plurality of voltage values, each voltage value being substantially equal to a reset voltage value associated with the generated intra-period reset pulse, the intra-period reset pulses progressively decreasing in pulse width; and measuring, only once during an

integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the generation of the plurality of intra-period reset pulses and prior to the generation of the second integration reset pulse.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose or suggest that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 1.

2. Independent Claim 24

As set forth above, independent claim 24 recites a method for measuring a sense node voltage associated with a light-detecting element, the sense node voltage being related to light intensity incident upon the light-detecting element, the light-detecting element having a reset

switch associated therewith so as to set a voltage level of the sense node by generating a first integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the first integration reset pulse, an edge of the first integration reset pulse triggering a beginning of a first integration period; generating a second integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the second integration reset pulse, an edge of the second integration reset pulse triggering a beginning of a second integration period; generating, subsequent to the generation of the first integration reset pulse and prior to the generation of the second integration reset pulse, a train of progressively decreasing intra-period reset pulses to enable resetting of the sense node voltage to a plurality of voltage values, each voltage value being substantially equal to a reset voltage value associated with the generated intra-period reset pulse; and measuring, only once during an integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the generation of the train of progressively decreasing intra-period reset pulses and prior to the generation of the second integration reset pulse, the train of progressively decreasing intra-period reset pulses progressively decreasing in pulse width.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear

curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose or suggest that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 24.

3. Independent Claim 31

As set forth above, independent claim 31 recites a method for measuring a sense node voltage associated with a light-detecting element, the sense node voltage being related to light intensity incident upon the light-detecting element by generating a first integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the first integration reset pulse, an edge of the first integration reset pulse triggering a beginning of a first integration period; generating a second integration reset pulse to enable a resetting of the sense node voltage to a voltage value substantially equal to a reset voltage value associated with the second integration reset pulse, an edge of the second integration reset pulse triggering a beginning of a second integration period; generating, subsequent to the generation of the first integration reset pulse and prior to the generation of the second integration reset pulse, a plurality of intra-period reset pulses to selectively reset the sense node voltage to a plurality of voltage values, each voltage value being substantially equal to a reset voltage value associated with the generated intra-period reset pulse, the intra-period reset pulses progressively decreasing in pulse width; and measuring, only once during an integration period, the sense node voltage generated in response to incident light intensity, the sense node voltage being measured subsequent to the generation of the plurality of intra-period reset pulses and prior to the generation of the second integration reset pulse.

In contrast, Kindt et al. discloses a method of integration that generates an initial reset pulse to reset the photodiode and start an integration period. Kindt et al. further discloses that a second reset pulse is generated to reset the photodiode and start a next integration period. Moreover, Kindt et al. discloses that multiple intra-period reset pulses are generated to reset the photodiode between the start of the integration period and the start of the next integration period.

The Examiner asserts that Kindt et al. discloses; at column 13, lines 40-62; that the intra-period reset pulses progressively decrease in pulse width.

In contrast, Kindt et al., at column 13, lines 40-62, discloses:

> Usually, the user will start by designing a curve such as shown in FIG. 5 (i.e., the user will define U_{bp1}, L_{bp1} and L_{max}). From this designed curve, the values (e.g., U_{x1}, T_{x1}, and optionally also T_{x0}) that are to be programmed into timing and control circuitry 35 can be found using a simple procedure that will be described below. First, the sensitivity of the first branch of the piecewise linear curve is used to determine the value of T_{x0} (the duration of the full integration period).

More specifically, Kindt et al. discloses that the voltage levels U and the timing of the pulses T can be programmed. As illustrated in Figures 2-4 of Kindt et al., the pulse widths of the reset pulses have no variability. Moreover, Kindt et al. fails to identify that the pulse widths of the reset pulses are variable characteristics.

Therefore, contrary to the Examiner's assertion, Kindt et al. fails to disclose or suggest that the intra-period reset pulses progressively decrease in pulse width, as set forth by amended independent claim 31.

4. Dependent Claims

With respect to dependent claims 2-10, 25-30, and 32-40, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly from allowable independent claims 1, 24, and 31. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

CONCLUSION

Accordingly, in view of all the reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw the present rejection. Also, an early indication of allowability is earnestly solicited.

Respectfully submitted,

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